

*In Situ* HAB Monitoring of the FDEP Gulf dispersal of Piney Point treated waste water  
Report covering the August 18 - 20, 2003 monitoring cruise and dye study

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## Introduction

Monitoring for Harmful Algal Blooms (HAB) during the dispersal of treated Piney Point waste water in the Gulf of Mexico is conducted at approximately biweekly intervals using vessels chartered from the Florida Institute of Oceanography (FIO). The overall objectives of the program are to collect samples that can be used to determine: 1. the presence of HAB species, 2. increases in biomass of phytoplankton populations, and nutrient concentrations. The specific objectives of this component of the HAB monitoring program are 1. to conduct a survey of surface waters along two transects within the dispersal region and provide maps of temperature, salinity, chlorophyll fluorescence, and light transmission; 2. Provide CTD profiles at fourteen locations outside of and within the dispersal area (Fig. 1) and collect surface and mixed layer samples that will be used for the analysis of chlorophyll-a concentration, phytoplankton species counts, and nutrient concentrations. The latter two analyses (counts and nutrients) will be performed by others and reported separately.

## Methods

CTD profiles are taken at fourteen stations along two transects that traverse the area where water dispersal occurs (Fig. 1). Stations 1 and 14 are located shoreward of the permitted dispersal zone and should be indicative of West Florida Shelf waters without Piney Point water additions. These two stations should also allow us to estimate if treated water moved shoreward.

Surface underway measurements are made along each transect using a Falmouth Scientific MicroCTD3 system coupled to a SeaPoint fluorometer, SeaPoint turbidity meter, and a WetLabs 10cm transmissometer measuring light transmission at 660 nm. The instruments are placed into a darkened vessel through which surface sea water is continuously circulated. Output of the CTD system is merged with GPS Latitude and Longitude and stored for later averaging and plots using Surfer<sup>R</sup> software.

Water samples are collected at three depths (surface, mixed layer, and subsurface chlorophyll maximum) in darkened 250 ml bottles for chlorophyll-a analysis. All samples are filtered through GFF glass fiber filters on board ship and immediately placed into 100% Methanol before storage at -20°C until extraction and fluorometric analysis in the laboratory following the method described by Holm-Hansen and Reimann (1979).

Data from the CTD profiles are averaged using SeaSoft<sup>R</sup> software and plotted with Surfer<sup>R</sup>.

## Results and Discussion

### *CTD transects*

Extracted chlorophyll-a and phaeopigment concentrations (Table 1) for surface samples for all locations were <0.3 µg/l. These values are within the expected range for this region of the West Florida Shelf. Samples collected at depth typically have elevated concentrations relative to surface values. These subsurface chlorophyll maxima (SCM) exhibit levels that are 2 to 3 fold greater than surface values. Depths of the SCM vary from 40m to 60m (Figs. 2 and 3).

Surface salinity below 34 was found at all stations along both transects (Figs. 2 and 3) with lowest values at St. 1, 8, 9, and 14. As indicated in earlier reports by Hu and Muller-Karger, transport of low salinity water from the Mississippi River has been ongoing throughout the barge dispersal trips made to date. This lower salinity water resulted in relatively stable buoyant layer with sigma-t values < 21 in the upper 10m to 20m of the water column. The 36 salinity isopleth , indicative of typical offshore water in the Gulf of Mexico occurred between 20m to 30m along both transects (Figs. 2 and 3). Based on the sigma-t values of individual CTD profiles mixing of surface waters could have occurred to depths of 10m to 20m (Figs. 4 and 5).

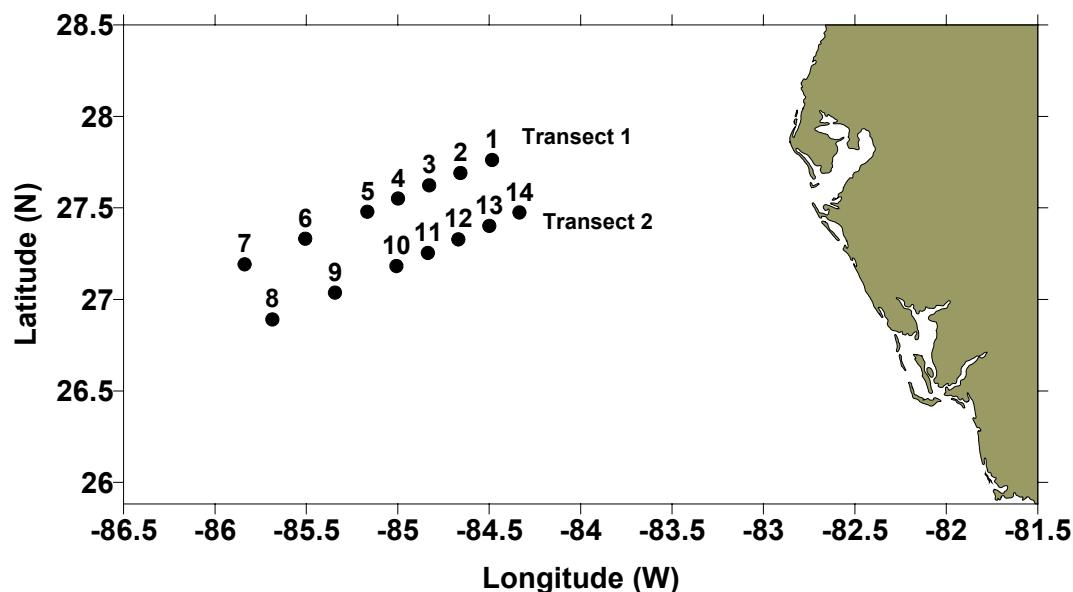
*In vivo* chlorophyll fluorescence, as seen in composites of both transects, further indicate the low surface values relative to the SCM with no indication of enhanced fluorescence along either transect. However, sharp peaks at Stations 3 to 7 with a remnant at St. 19 (Figs 4 and 5) were not seen in earlier cruises. Extracted chlorophyll and phaeopigment values (Table 1) do not reflect these peaks but they may have been missed by the grab samples since they occurred between the surface and 10m samples. The fact that they do not persist in water sampled along the second transect suggest they were transient and were mixed throughout the upper water column.

#### Dye study

Continuous underway measurements were made during the second dye study which took place during this monitoring cruise. With the exception of a very slight East to West gradient in all measured parameters there were no discernable changes along the path of the dye study (Fig 6 A and B).

#### Reference

Holm-Hansen, O. and B. Reimann. 1979. Chlorophyll a determinations: Improvements in methodology. OIKOS 30: 438-441.



**Fig. 1: Location of Stations for CTD profiles and sampling during dispersal of treated water from the Piney Point phosphate plant.**

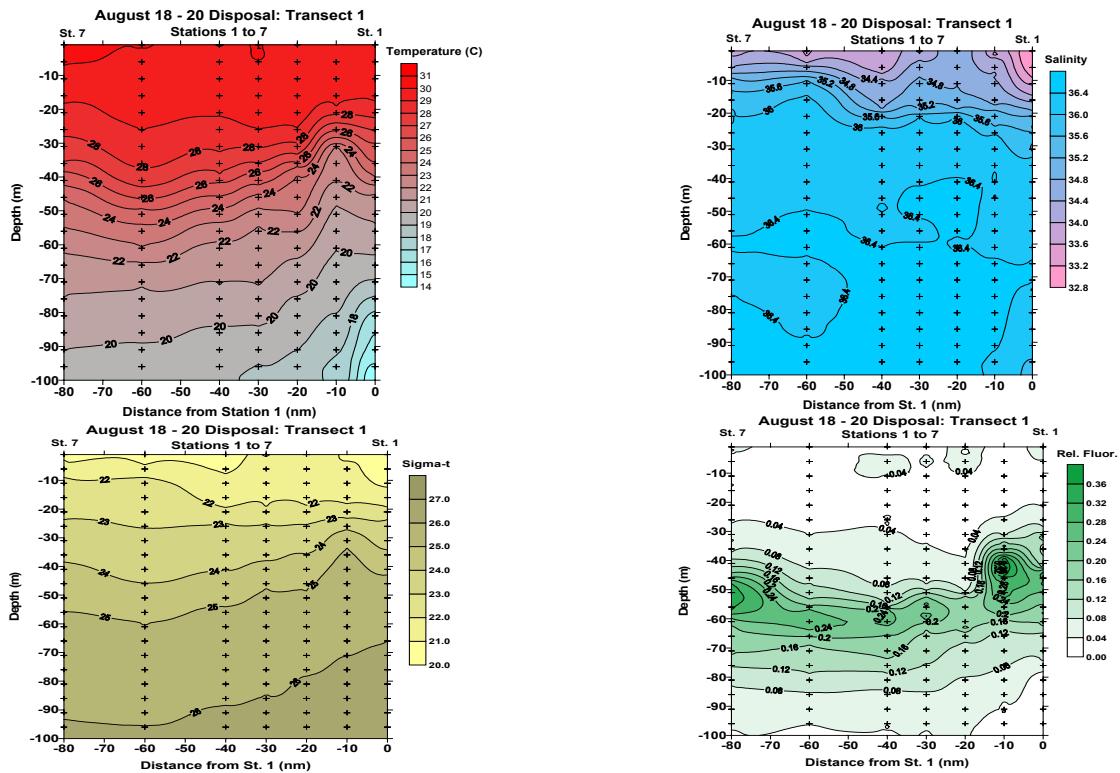


Fig. 2: Composite CTD profiles along transect 1 during the August 18–20, 2003 dispersal of treated Piney Point water

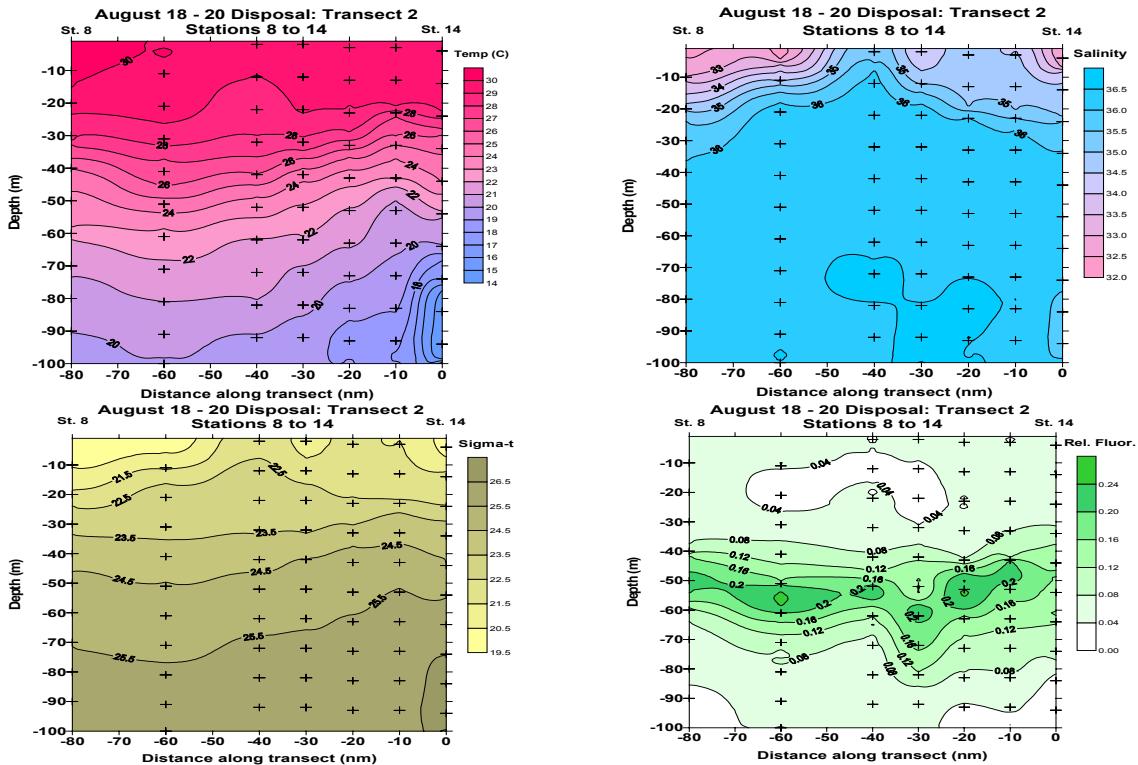


Fig. 3: Composite CTD profiles along transect 2 during the August 18–20, 2003 dispersal of treated Piney Point water.

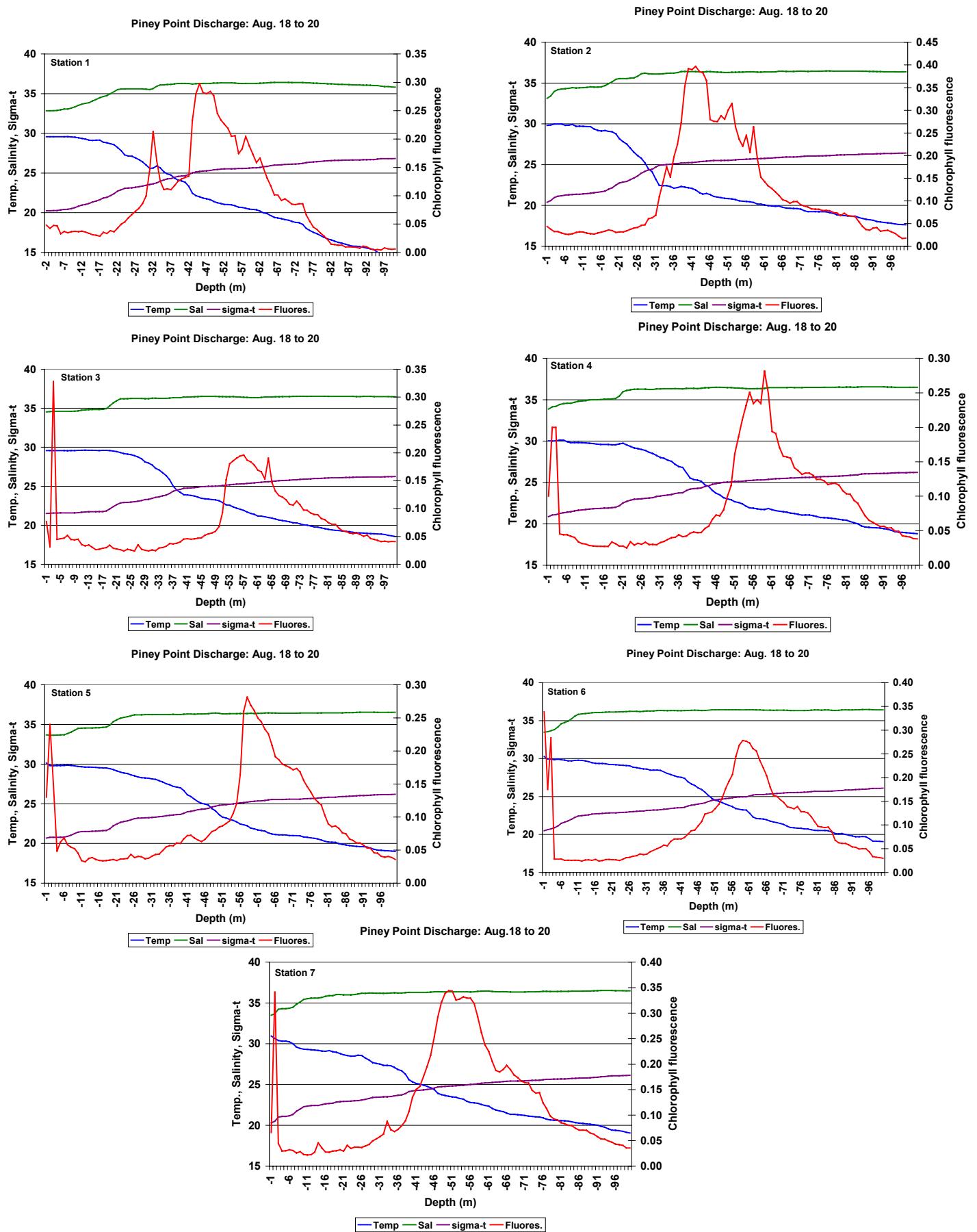


Fig. 4: CTD profiles for Stations 1 to 7, Aug. 18 to 20

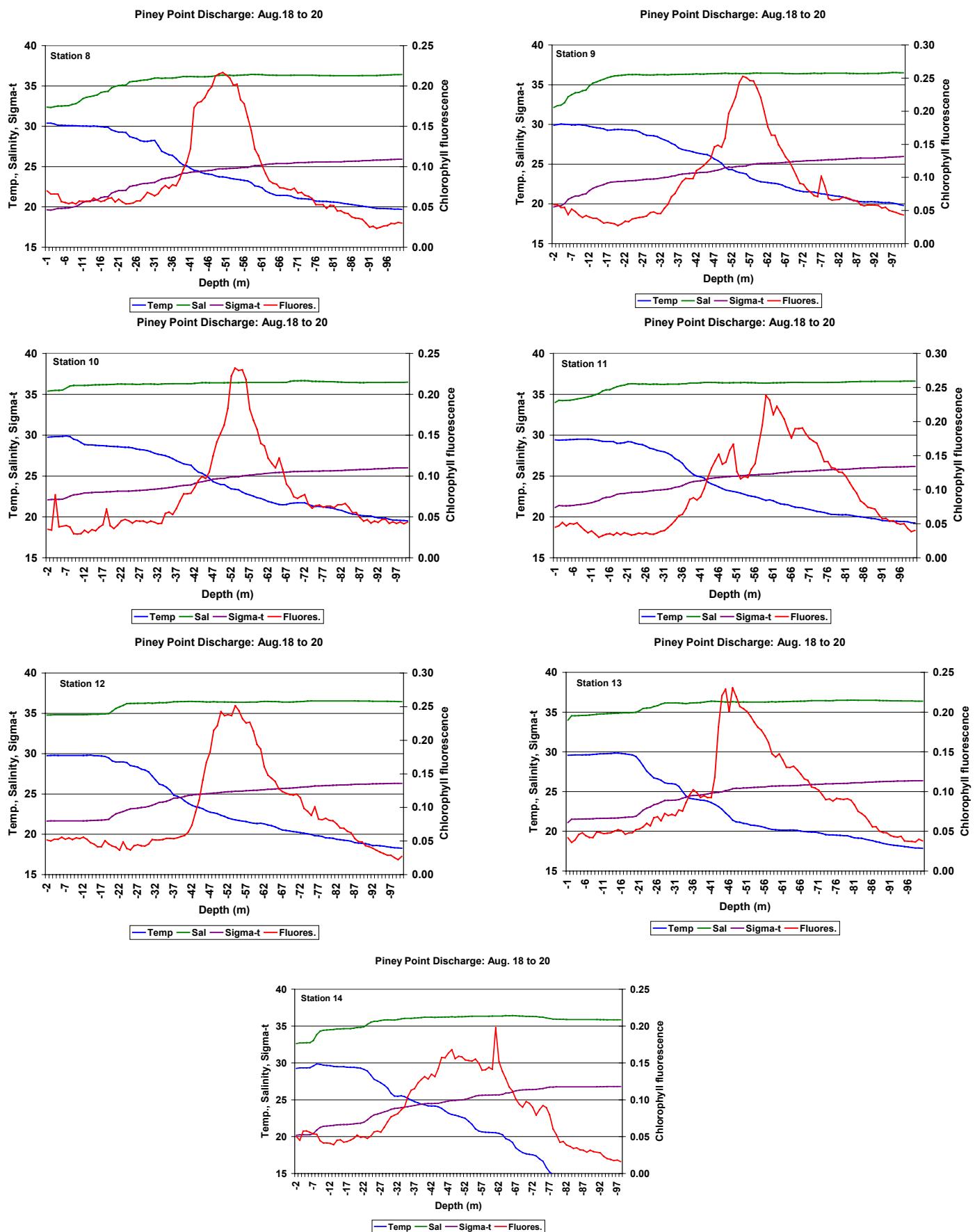


Fig. 5: CTD profiles for Stations 8 to 14, Aug. 18 to 20

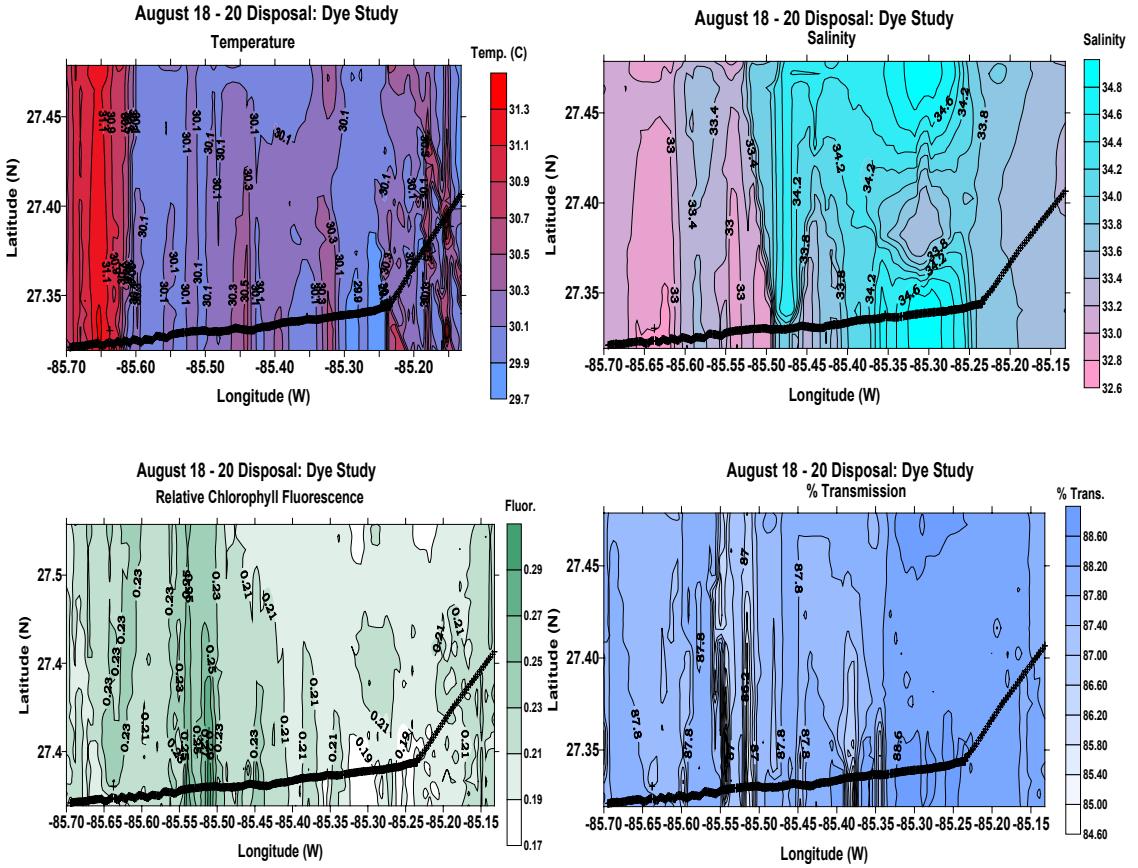


Fig. 6A: Composite of underway parameters measured during the dye study conducted during the August 18 – 20, 2003 monitoring cruise.

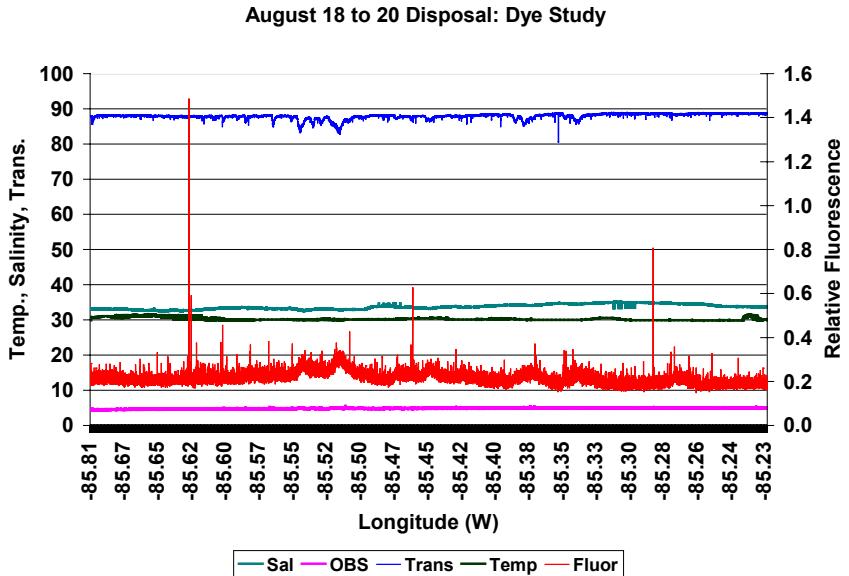


Fig. 6B: Levels of parameters continuously measured in surface water along the dye study track during the August 18 – 20, 2003 monitoring cruise.

